ASTRAGALOID OSTEOTOMY IN THE TREATMENT OF FLAT-FOOT.

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FOR some time it has been a matter of doubt to me as to whether the generally held theories as to the ætiology of pes planus or flat-foot were such as should be unhesitatingly accepted. These have been two-fold—one based on an alleged relaxation of certain ligamentous structures, notably the calcaneo-scaphoid ligament; and the other that it is largely, in some cases entirely, due to a paralytic condition of certain muscles connected with the ankle and foot, more especially the tibialis anticus.

My doubts as regards the value to be placed on the first of these theories have arisen mainly from there having been up to this no satisfactory demonstration of the existence of ligamentous relaxation; from observing that in a large proportion of the cases that have fallen under my observation the deformity occurred, not in delicate, weakly, anæmic subjects, but in young persons who were strong, healthy, and well nourished; and from noticing how uniformly unsuccessful the attempts are to permanently remedy the deformity by any of the routine lines of practice, such as pushing up the arch of the foot and keeping it in that position by any of the various mechanical adjustments designed for this purpose.

In these cases, too, there has been an entire absence of any evidence of local paralysis.

These facts have naturally shaken my belief in the views as to the ætiology of the conditions which are usually taught, accepted, and acted on by surgeons.

However, not having until recently an opportunity of either verifying or disproving these doctrines by means either of dissection, or inspection in pathological museums of examples of the deformity—for, strange to say, although it is a defect of such common occurrence, the pathological museums are singularly deficient in examples of it—I consequently was unable to arrive at any definite conclusion as to what should or should not be accepted as regards the causation and pathology of the deformity.

My attention was, comparatively recently, directed again to the subject on reading Professor Ogston's paper on flat-foot—one written with that ability and originality which characterise his contributions and make them so grateful to the surgical student.

In this communication he advocates a complete revolution in the previously accepted methods of dealing with the deformity—viz., cutting down on the astragalo-scaphoid articulation, removing a thin slice from the surfaces of these bones where they articulate with each other, restoring the arch of the foot, and fixing the two bones together with fine ivory pegs, which are left in the wound. This procedure has been attended, it is stated, with eminently satisfactory results. There are, however, two features in it which appear to me to detract somewhat from its merit—one, that the operation is so complicated and difficult; and another, and more important, is that one of the articulations in the tarsus is necessarily completely obliterated, an object of the operation being to get, after reducing the deformity, anchylosis of the astragalo-scaphoid joint.

Before discussing the method of operation adopted in the case I desire to record, I may previously advert to the views already alluded to in reference to the ætiology of the defect. As regards the opinion emphasised by Professor Sayre, and, I am informed, endorsed by Mr. Barwell in reference to a paralytic condition of certain muscles, notably the tibialis anticus, I would say that, without denying the possibility in certain cases of this condition aiding in, or being the cause of the production of the deformity, it must, I think, be very rarely a determining factor. I have never satisfied myself of its existence in any of the cases that have come under my notice, and I observe in Mr. Symington's excellent paper on flat-foot in the October number of the *Journal of Anatomy and Physiology* that Mr. Golding Bird failed to find it in any of his cases, which were fifty in number, although he always looked for it.

A twofold cause is mentioned by the late Professor Hueter (*Grundriss Chirurgie*)—one a hyperpronation of the foot in infancy when, namely, the child begins to walk, coupled with and possibly caused by ligamentous relaxation. This latter view is combated by von Meyer, who denies the relaxation of the calcaneo-scaphoid ligament, and attributes the deformity to a displacement of the astragalus due to an excess of its natural movements. Whether this opinion is founded on *post-mortem* examination or is merely the result of theoretic speculation I am unable to say. But whether it is or not, due weight must be attached to his opinion on the subject.

In the debate which took place last August at the International Medical Congress at Copenhagen on talipes and its treatment, the opinions of several authorities were distinctly in favor of the view—contrary to what is generally held and taught—that to original osseous malformation, rather than to muscular or ligamentous abnormality, must we look for explanation of these deformities. The opinion I then expressed was strongly opposed to this view, but I am free to admit that from what I then heard and have since ascertained, I should not, were the discussion to take place again, express myself quite so decidedly as I did.

If the original malformation theory holds good of the ordinary forms of talipes it should do so equally of pes planus, and a study of Mr. Symington's case tends greatly to strengthen this view. The signal failure that so frequently attends the mechanical treatment adopted in these cases also does so, as well as the inspection of the specimen which, through the kindness of our President, I am able to lay before the meeting.

It was, in truth, with feelings of no ordinary satisfaction that I obtained the opportunity of inspecting this singularly interesting specimen just alluded to—the only one of the kind, so far as I am aware, in this country, and which verifies to so great an extent the views I have held so long as to the ætiology of the defect. Professor Cunningham, too, who has carefully examined this specimen, agrees with me in the propriety of dismissing the idea that ligamentous relaxation would alone account for the changes here present, and the same remark may be made in reference to paralysis being an ætiological factor. The principal osseous abnormalities are those observed in the astragalus and os calcis. In the former of these it may be observed that the head of the bone is directed downwards instead of forwards, and its articular surface in contact, not with the scaphoid, but inferior calcaneo-scaphoid ligament; that on the upper and now anterior portion of the neck of the bone is an abnormal facet articulating with a somewhat hypertrophied scaphoid; that the distance between the posterior margin of the scaphoid and anterior edge of sustentaculum tali is nearly double what it is in the normal condition of things; that the sustentaculum tali, instead of forming a nearly horizontal base of support for the astragalus head, is directed obliquely downwards and forwards, the groove immediately posterior to it, as pointed out to me by Professor Cunningham, looking backwards instead of downwards. The head of the astragalus is enlarged, and the neck of the bone is lengthened on its upper or now anterior surface, whereas posteriorly its length is normal or nearly so. The body of the bone is apparently unaltered, its trochlear surface maintaining its normal relations.

If the views of von Meyer and those who think with him were correct, that, namely, the deformity is due to displacement of the astragalus forwards and inwards, the body of the bone should partake of the displacement as well as the neck and head, the trochlear surface should be directed forwards, and a new articular facet formed, or an extension of the normal one backwards.

The interosseous ligament is evidently the means of keeping the body of the bone in its position and relieving the calcaneo-scaphoid ligament of pressure. That it did so in this case is obvious, inasmuch as its upper articular surface preserves its normal relations.

The changes in the position of the bone indicated by von Meyer are in this case non-existent.

My contention, therefore, is that we must look to something else besides relaxed ligaments and paralysed muscles as causing these remarkable changes, though I do not, of course, deny that they may not at times be present.

Having regard to the osseous deformities in this remarkable case, as well as the very similar state of things found in Mr. Symington's, it is not surprising that the routine line of practice already alluded to should, as a rule, prove so ineffective. This is especially obvious in those instances constituting, I believe, the majority of those cases in which there is, as may be here observed, an abnormal projecting angle or ridge separating the articular surface into two portions—one articulating with the scaphoid, and the other with the inferior calcaneo-scaphoid ligament. This projecting ridge forms an effectual barrier in preventing a restoration of the arch by any pressure made from without.

CASE.—In April, 1884, a youth æt. 14 years, came under my care in the Richmond Hospital, in one of whose feet all the physical characters of flat-foot were well marked. He was a well-nourished, strongly-built, fresh-complexioned lad, whose health generally had always been excellent. He complained greatly of pain in the foot, especially about the medio-tarsal joint, after walking for a short distance or standing for even a very limited time, and consequently he was unable, as his relatives stated, to take sufficient exercise or join in the recreations of his companions. The case appeared to me to be in every way suitable for operative interference, the condition of things causing much trouble to the patient, and the case being one in which the arch of the foot could not be restored by any reasonable force or pressure from without. In order to render the parts to be operated on as perfectly aseptic as possible, for several days a process similar to that recommended by Professor Ogston, of frequent washing with a (1—20) solution of carbolic acid, rubbing off all superfluous epidermis, and keeping the foot day and night carefully wrapped in several layers of moistened carbolised gauze, and applying immediately before the operation spirits of turpentine, was used. I made an incision (under a carbolic spray strongly directed on the part) an inch and a half in length along the inner edge of the foot, the centre of which incision was the prominence caused by the head of the astragalus, though of this, I confess, I was not quite certain, until I exposed it, as to whether, namely, the tumor was formed by the head of the astragalus or tuberosity of the scaphoid. In some cases I have little doubt it is caused by the latter.

At the centre of the incision I made along the inner edge of the foot I made another three-quarters of an inch in length, and at right angles to the first, and a little behind the situation of Chopart's joint, and dissected back the two small triangular flaps of skin for about half an inch. My object was, if possible, not to open the joint, but to remove a wedge-shaped piece of the enlarged head of the astragalus, which wedge should have its base below an apex above, and which, if removed, would enable the depressed portion of the tarsus to be elevated and the arch restored. On taking out the wedge, which I did with an osteotome, I found that it was impossible to avoid implicating Chopart's joint, and accordingly a portion of bone was removed, which included a part of the abnormal facet which articulated with the scaphoid. I found then that by adducting and supinating the foot the arch was perfectly restored. Listerian dressings were then applied, but without drainage. In the healing of the wound there was no pus production, and the patient was afebrile throughout. On the wound being healed, the method I adopted for keeping the foot in a position of adduction was a simple one, and one to be recommended in these cases—namely, the application of a Dupuytren's splint applied as in a case of Pott's fracture of the fibula. In this case it was kept on for a fortnight, when a gypsum bandage was substituted for it. The result was most satisfactory, and an examination of the case, made in the sixth month after the operation, was such as to make me look forward with confidence to the good result being permanent, the patient informing me—and his statement was endorsed by his friends—that he was able to walk, run, and play about as well as any other healthy boy of his own age.

From the foregoing remarks the following propositions may be considered :—

1. That the theory of ligamentous relaxation being the chief factor in the production of flat-foot is erroneous, being in the majority of cases the result and not the cause of that deformity.

2. That elongation of the calcaneo-scaphoid ligament should not be mistaken, as it so often is, for relaxation of it.

3. That the altered direction of the sustentaculum tali is a change that could not be directly or indirectly connected with either ligamentous relaxation or muscular paralysis.

4. That the osseous deformation, whether resulting from original malformation, or rickets, or other pathological change in genu valgum—a condition until quite recently believed to

depend solely on ligamentous relaxation—furnishes an *à priori* argument in favor of the author's theory.

5. That the treatment of pes planus in cases, at all events, where the deformity is irreducible should be directed mainly to restoring the arch of the foot by operative interference with the misshapen astragalus.

6. That this is feasible without destruction of the medio-tarsal joint.

7. That the evidence in favor of muscular paralysis being an ætiological movement in the production of flat-foot is insufficient and unsatisfactory.

8. That deformity of the scaphoid, the result of disease, may also be looked upon as a cause of flat-foot.

9. That the appearances in the specimens noted by Mr. Symington and the author furnish strong proof of the truth of the connexion between flat-foot and original osseous malformation.

10. That after astragaloid osteotomy it is desirable to keep the foot, during the healing of the wound, in a state of supination, which can be conveniently effected by the application of a Dupuytren's splint, as used in fractured fibula.